

Getting Started with XIAO nRF52840Sense

As the advanced version of the board XIAO nRF52840, XIAO nRF52840 Sense has equipped a powerful Nordic nRF52840 MCU which is designed in a Bluetooth 5.0 module, built around 32-bit ARM® Cortex™-M4 CPU with Floating-Point Unit(FPU) operating at 64Mhz. With the capabilities of wireless connection, it still remains the XIAO series classic form-factor of small and exquisite which can be used for wearable devices and Internet of Things projects. Furthermore, it only costs 5 μ A in the deep sleep model and it supports battery charge management because of the BQ25101 chip.

In addition, it carries two extra onboard sensors. One of them is a digital microphone created through Pulse Density Modulation(PDM) module on the nRF52840 chip. It can receive audio data in real-time which allows it can be used for audio recognition. The board not only receives audio data but also can speak through the MSM261D3526H1CPM microphone. The other one is 6-axis Inertial Measurement Unit(IMU) which can be applied in TinyML projects like gesture recognition. These onboard sensors provide a great convenience for users and the ultra-small size feature of the board has still remained.

Same as XIAO nRF52840, XIAO nRF52840 Sense contains a wealthy interface. The first thing to note is that the Near Field Communication(NFC) is



functional on the board. Secondly, there is a tiny and elegant reset button on one side of the Type-C interface. On the other side, it is designed in a three-in-one LED along with a power LED. There are 11 digital i/o that can be used as PWM pins and 6 analog i/o that can be used as ADC pins. It supports UART, IIC, and SPI all three common serial ports. Same as XIAO RP2040, it has an onboard 2 MB flash which means it can also be programmed by Arduino, Micro Python, Circuit Python, or other program languages.

Features

- Powerful wireless capabilities: Bluetooth 5.0 with onboard antenna
- Powerful CPU: Nordic nRF52840, ARM® Cortex®-M4 32-bit processor with FPU, 64 MHz
- Ultra-Low Power: Standby power consumption is less than 5µA
- Battery charging chip: Supports lithium battery charge and discharge management
- Onboard 2 MB flash
- Onboard PDM microphone
- Onboard 6-axis LSM6DS3TR-C IMU
- Ultra Small Size: 20 x 17.5mm, XIAO series classic form-factor for wearable devices
- Rich interfaces: 1xUART, 1xI2C, 1xSPI, 1xNFC, 1xSWD, 11xGPIO(PWM),6xADC
- Single-sided components, surface mounting design



FCC Caution:

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

IMPORTANT NOTE:

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.



—Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

—Consult the dealer or an experienced radio/TV technician for help.

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

OEM/Integrators Installation Manual

List of applicable FCC rules This module has been tested and found to comply with part 15.247 requirements for Modular Approval.

Summarize the specific operational use conditions This module can be applied in household electrical appliances as well as TV and IP camera. The input voltage to the module should be nominally 5VDC, typical value 5VDC and the ambient temperature of the module should not exceed 85°C.

Limited module procedures

N/A

Trace antenna designs

N/A

Antennas

The module of XIAO-nRF52840 Sense has one Chip Antenna for BLE and the



antenna gain is 2.0dBi.

Label and compliance information When the module is installed in the host device, the FCC ID label must be visible through a window on the final device or it must be visible when an access panel, door or cover is easily re-moved. If not, a second label must be placed on the outside of the final device that contains the following text: Contains Transmitter Module

FCC ID: Z4T-XIAONRF52840, the FCC ID can be used only when all FCC ID compliance requirements are met.

Information on test modes and additional testing requirements

The modular transmitter has been fully tested by the module grantee on the required number of channels, modulation types, and modes, it should not be necessary for the host installer to re-test all the available transmitter modes or settings. It is recommended that the host product manufacturer, installing the modular transmitter, perform some investigative measurements to confirm that the resulting composite system does not exceed the spurious emissions limits or band edge limits (e.g., where a different antenna may be causing additional emissions).

The testing should check for emissions that may occur due to the intermixing of emissions with the other transmitters, digital circuitry, or due to physical properties of the host product (enclosure).



This investigation is especially important when integrating multiple modular transmitters where the certification is based on testing each of them in a stand-alone configuration. It is important to note that host product manufacturers should not assume that because the modular transmitter is certified that they do not have any responsibility for final product compliance.

If the investigation indicates a compliance concern the host product manufacturer is obligated to mitigate the issue. Host products using a modular transmitter are subject to all the applicable individual technical rules as well as to the general conditions of operation in Sections 15.5, 15.15, and 15.29 to not cause interference.

The operator of the host product will be obligated to stop operating the device until the interference have been corrected .

Additional testing, Part 15 Subpart B disclaimer

The final host / module combination need to be evaluated against the FCC Part 15B criteria for unintentional radiators in order to be properly authorized for operation as a Part15 digital device. The host integrator installing this module into their product must ensure that the final composite product complies with the FCC requirements by a technical assessment or evaluation to the FCC rules, including the transmitter operation and should refer to guidance in KDB 996369. For host products with certified modular transmitter, the frequency range of investigation of the composite system is specified by



rule in Sections 15.33(a)(1) through (a)(3), or the range applicable to the digital device, as shown in Section 15.33(b)(1), whichever is the higher frequency range of investigation. When testing the host product, all the transmitters must be operating. The transmitters can be enabled by using publicly available drivers and turned on, so the transmitters are active. In certain conditions it might be appropriate to use a technology-specific call box (test set) where accessory devices or drivers are not available. When testing for emissions from the unintentional radiator, the transmitter shall be placed in the receive mode or idle mode, if possible. If receive mode only is not possible then, the radio shall be passive (preferred) and/or active scanning. In these cases, this would need to enable activity on the communication BUS (i.e., PCIe, SDIO, USB) to ensure the unintentional radiator circuitry is enabled. Testing laboratories may need to add attenuation or filters depending on the signal strength of any active beacons (if applicable) from the enabled radio(s). See ANSI C63.4, ANSI C63.10 and ANSI C63.26 for further general testing details.

